UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHRISTOPHER A. SCHANTZ, KYLE J. SCHLEIFER, WILLIAM D. FISHER, MICHAEL P. CAREN and PETER G. WEBB

Appeal No. 2003-1673
Application 09/558,532[1]

Before: WILLIAM F. SMITH, Administrative Patent Judge, McKELVEY, Senior Administrative Patent Judge, and HANLON, Administrative Patent Judge.

HANLON, Administrative Patent Judge.

Decision on appeal under 35 U.S.C. § 134

The appeal is from a decision of an examiner rejecting all of the pending claims.

A. Background

1. Claims 1 though 34 and 36 through 44 were finally rejected under 35 U.S.C. § 103(a). Paper 9.

2. In response to the final rejection, applicants filed a notice of appeal and a proposed amendment. Papers 11 and 12.

[1]Application for patent filed April 26, 2000. The real party in interest is Agilent Technologies, Inc. (Paper 14, Brief, p. 2).

3. The proposed amendment canceled claims 1 through 3, 8, 12, 18 through 20, 22 through 27, 33 through 37 and 39 through 42 and amended certain other claims. Paper 12.

4. In an advisory action, the examiner indicated that for purposes of appeal, the proposed amendment would be entered, and claims 4 through 7, 9 through 11, 13 through 17, 21, 28 through 32, 38, 43 and 44 stand rejected. Paper 13.

5. Applicants subsequently filed an appeal brief. Paper 14.

6. The examiner entered an answer in response to the appeal brief. Paper 15.

7. Applicants filed a reply brief in response to the examiner's answer. Paper 18.

8. The application was received at the Board of Patent Appeals and Interferences on June 17, 2003, and was assigned Appeal No. 2003-1673. Paper 16.

9. A panel of the board entered a request for applicants to address matters under 37 CFR § 1.196(d). Paper 17.

10. In that paper, applicants were requested to address certain matters related to the specification and the drawings and read the claims on appeal onto the drawings. Paper 17, p. 5.

11. Applicants timely filed a response to the panel's request. Papers 19 and 20.

B. Findings of fact

The record supports the following findings by a preponderance of the evidence.

Applicants' invention

12. The invention relates to arrays, particularly polynucleotide arrays such as DNA arrays, which are said to be useful in diagnostic, screening, gene expression analysis, and other applications. Specification, p. 1, lines 6-8.

13. Arrays (Fig. 1,[2] item 12) according to the invention contain multiple spots or features (Fig. 2, item 16) of biopolymers in the form of polynucleotides. Specification, p. 10, lines 25-26; Figures 1-3.

14. A "biopolymer" is a polymer of one or more types of repeating units and particularly includes peptides or polynucleotides. Specification, p. 8, lines 22-24.

15. An "array" includes any one, two or three dimensional arrangement of addressable regions bearing a particular chemical moiety to moieties (for example, biopolymers such as polynucleotide sequences) associated with that region. Specification, p. 9, lines 15-18.

16. An array is "addressable" in that it has multiple regions of different moieties such that a region (a "feature" or "spot" of the array) at a particular predetermined location (an "address") on the array will detect a particular target or class of targets. Specification, p. 9, lines 18-22.

17. In the case of an array, the "target" will be referenced as a moiety in a mobile phase to be detected by probes which are bound to the substrate at the various regions. Specification, p. 9, lines 23-25.

18. Biopolymer arrays can be fabricated by depositing previously obtained biopolymers onto a substrate or by synthesizing the biopolymer *in situ*. Specification, p. 1, lines 24-26.

19. For *in situ* fabrication methods, multiple different reagent droplets are deposited at a given target location to form the final feature on the array substrate. Specification, p. 1, lines 29-31.

---

[2]References to the Figures are to drawings submitted by applicants in response (Paper 19) to the board's request for information under 37 CFR § 1.196(d) (Paper 17).

20. We are told that it is important in array fabrication that (A) features (1) are actually present, (2) put down accurately in the desired target pattern, and (3) correctly sized, and (B) the DNA is uniformly coated within the feature. Specification, p. 3, lines 4-6.

21. If any of these conditions are not met within a reasonable tolerance, and the array user may not be aware of deviations outside such tolerance, the results obtained from a given array may be unreliable and misleading. Specification, p. 3, lines 6-9.

22. Unreliable results can have serious consequences to diagnostic, screening, gene expression analysis or other purposes for which the array is being used. Specification, p. 3, lines 9-10.

23. It is desirable to provide a means by which errors in features from the fabrication process can be readily determined. Specification, p. 3, lines 13-14.

24. It is also desirable to correct or track errors. Specification, p. 3, lines 14-15.

25. The invention is a method of fabricating at least one addressable array of biopolymers on a substrate with an apparatus having a drop dispensing unit and a sensor. Specification, p. 4, lines 3-5.

26. According to the described method, droplets carrying the biopolymers or biopolymer precursors are dispensed from the drop dispensing unit onto the sensing element. Specification, p. 4, lines 5-6.

27. Droplets are also dispensed onto the substrate, for each of multiple addresses, to fabricate the array. Specification, p. 4, lines 6-7.

28. Electrical signals are detected from dispensed droplets striking the sensing element. Specification, p. 4, lines 7-8.

29. A performance characteristic of the apparatus is evaluated based on the detected signals. Specification, p. 4, lines 10-11.

30. Performance characteristics include size, velocity or placement of droplets dispensed from the dispenser unit. Specification, p. 5, lines 15-17.

31. The invention further includes an apparatus for fabricating at least one addressable array of biopolymers on a substrate in accordance with any one or more of the methods of the present invention. Specification, p. 6, lines 1-3.

32. The apparatus may include (1) a drop dispensing unit, (2) a sensing element (Fig. 4, item 214) and (3) an amplifier (Fig. 4, item 172) to detect electrical signals resulting from dispensed droplets striking the sensing element. Specification, p. 6, lines 3-5; Figure 4.

33. The drop dispensing unit is in the form of a dispensing head (Fig. 4, item 210). Specification, p. 11, line 24; Figure 4.

34. The dispensing head may be of a type commonly used in an ink jet type of printer. Specification, p. 12, line 20.

35. The apparatus may also include a processor (Fig. 4, item 140) which causes droplets to be dispensed from the drop dispensing unit toward the sensing element and evaluates a performance characteristic of the dispensing unit based on the resulting detected electrical signals. Specification, p. 6, lines 15-21; P. 15, lines 16-18; Figure 4.

36. The processor may also control the relative positions of the substrate and dispenser unit as well as the dispensing of droplets from the dispenser unit. Specification, p. 7, lines 4-6.

U.S. Patent No. 6,086,190 to Schantz et al. ("Schantz")

37. Schantz is prior art under 35 U.S.C. § 102(e).

38. The invention described in Schantz relates to the field of printers. Col. 1, line 6.

39. According to Schantz, prior printers commonly include one or more print heads that eject ink drops onto paper. Col. 1, lines 10-12.

40. Such a print head usually includes multiple nozzles through which ink drops are ejected. Col. 1, lines 12-13.

41. Typically, a print head ejects ink drops in response to drive signals generated by print control circuitry in the printer. Col. 1, lines 14-15.

42. The nozzles through which ink drops are ejected can become clogged with paper fibers or other debris during normal use or clogged with dry ink during prolonged idle periods. Col. 1, lines 25-28.

43. Schantz recognizes that it would be desirable to provide a printer with a mechanism for detecting whether ink drops are being ejected from the print head. Col. 1, lines 41-43.

44. Such a mechanism could be used to determine whether a print head actually requires cleaning. Col. 1, lines 43-44.

45. A mechanism for detecting ink drops could also be used to detect permanent failures of individual nozzles. Col. 1, lines 45-46.

46. Schantz describes an ink drop detector which employs preexisting digital signal processing elements in a printer and analog sensing circuitry. Abstract; col. 2, lines 21-23.

47. The preexisting digital signal processing elements include an analog-to-digital converter, a printer processor and a memory. Col. 2, lines 61-64.

48. The sensing circuitry includes a sensing element which is imparted with an electrical stimulus when struck by a series of ink drop bursts ejected from a print head. Col. 2, lines 23-26.

49. The sensing element may be contained in a trough or spittoon that accepts test ink drops fired from the print head. Col. 7, lines 19-21.

50. The spittoon prevents test ink drops from contaminating other parts of the printer. Col. 7, lines 21-22.

51. Alternatively, the sensing element may be positioned beneath a paper path in a printing area opposite the print head. Col. 7, lines 47-49.

52. The sensing circuitry also includes a sense amplifier which is tuned to a frequency or frequencies at which the ink drop bursts are ejected from the print head. Col. 2, lines 26-29.

53. The sense amplifier generates an output signal in response to the ink drop bursts striking the sensing element. Col. 2, lines 29-30.

54. The printer processor performs a digital signal processing function on the output signal which determines a magnitude of the output signal. Col. 3, line 65-col. 4, line 4.

55. The magnitude provides a drop detection value that is used to characterize ink drops ejected from the print head during an ink drop test cycle. Col. 4, lines 4-7.

56. Characteristics include whether any ink drops were ejected during the ink drop test cycle, the volume of the ink drops ejected during the ink drop test cycle, and the velocity of the ink drops ejected during the ink drop test cycle. Col. 4, lines 7-12.

57. The drop detection value is useful for rendering a go/no-go decision on each of the nozzles in the print head. Col. 6, lines 38-39.

58. In one embodiment, the printer processor tests a few nozzles on the fly at the end of a print cycle on a page. Col. 6, lines 39-42.

59. If the drop detection value from a particular ink drop test cycle is too low then the printer applies the print head to the service station in the printer. Col. 6, lines 42-44.

60. If after cleaning several times, the particular nozzle or nozzles are still bad then the printer processor can adjust its printing algorithm embodied in the printing code to compensate for the bad nozzle or provide an error indication to a user of the printer that the print head should be replaced. Col. 6, lines 44-49.

61. The drop detection value is also useful for adjusting the drive voltages to individual ones or groups of nozzles in a thermal print head in order to enhance the life of the heating elements contained therein. Col. 6, line 65-col. 7, line 1.

62. The printer processor can conduct firing trials on individual nozzles or groups of nozzles to detect the minimum level of drive voltage required to fire ink drops. Col. 7, lines 9-11.

63. During these trials, the printer processor varies the drive voltages or pulse width of the drive voltages until the drop detection value indicates optimum drive conditions for a particular nozzle. Col. 7, lines 12-15.

64. The printer processor selects a minimum voltage operating point that will extend the life of the heating elements in the thermal print head. Col. 7, lines 15-17.

U.S. Patent No. 5,474,796 to Brennan ("Brennan")

65. Brennan is prior art under 35 U.S.C. § 102(b).

66. Brennan describes a method for producing peptide array plates. Col. 3, lines 31-32.

67. According to the described method, a piezoelectric pump delivers minute droplets of liquid onto a surface. Col. 6, lines 18-20.

68. The design of the pump is similar to the pumps used in ink jet printing. Col. 6, lines 20-21.

69. The pump unit assembly consists of nozzle array heads for each of the four nucleotides and a fifth head for an activating reagent. Col. 8, lines 50-53; Figure 6.

70. When energized, a microdroplet is ejected from the pump nozzle and deposited on an array plate at a functionalized binding site. Col. 8, lines 53-55.

71. Droplets are deposited onto the array plate until the array is completed. Col. 8, lines 11-15.

U.S. Patent No. 5,807,522 to Brown et al. ("Brown")

72. Brown is prior art under 35 U.S.C. § 102(b).

73. Brown describes a method and apparatus for forming microarrays of biological samples on a support. Abstract; col. 1, lines 15-19.

74. According to the described method, a dispenser is loaded with a selected analyte-specific reagent solution. Col. 7, lines 54-55.

75. An "analyte-specific assay reagent" refers to a molecule effective to bind specifically to an analyte molecule. Col. 6, lines 25-26.

76. An "analyte" or "analyte molecule" refers to a molecule such as a polynucleotide or polypeptide whose presence, amount, and/or identity are to be determined. Col. 6, lines 20-23.

77. The dispenser is moved to a selected position with respect to a support surface and the dispenser tip is placed directly above the support-surface position at which the reagent is to be deposited. Col. 7, lines 58-61.

78. Liquid is dispensed from the tip onto the support surface. Col. 7, line 65-col. 8, line 11; Figure 2C.

79. After a volume of the reagent is deposited onto the support, the tip is moved to a corresponding position on a second support, a droplet is deposited at that position, and this process is repeated until a liquid droplet of the reagent has been deposited at a selected position on each of a plurality of supports. Col. 9, lines 5-10.

80. The tip is then washed to remove the reagent liquid, filled with another reagent liquid and this reagent is now deposited at another array position on each of the supports. Col. 9, lines 11-13.

81. In another aspect, the invention includes an automated apparatus for forming an array of analyte-assay regions on a solid support. Col. 9, lines 52-55.

82. The apparatus includes a dispenser having an open-capillary channel terminating at a tip. Col. 9, lines 56-61; Figures 1 and 2A-2C.

83. The dispenser is mounted for movement along an "x" axis and a "y" axis to position the dispenser at associated positions on adjacent supports. Col. 10, lines 7-45.

84. Figure 9 illustrates a substrate constructed according to the invention. Col. 11, lines 52-53.

85. The substrate has a rectangular array (Fig. 9, item 112) of cells (Fig. 9, items 114, 116) formed on the substrate surface. Col. 11, lines 53-55.

86. Each cell supports a microarray (Fig. 10, item 118) of distinct biopolymers, such as polypeptides or polynucleotides, at known, addressable regions of the microarray. Col. 11, lines 55-58; Figure 10.

U.S. Patent No. 4,067,019 to Fleischer et al. ("Fleischer")

87. Fleischer is prior art under 35 U.S.C. § 102(b).

88. Fleischer describes a sensing arrangement for accurately detecting the position of ink jet or similar drop impact thereon including a flat piezo-electric and two parallel, closely-spaced conductors. Abstract; col. 2, lines 34-37.

89. A transducer is formed from a thin poled piezoelectric material (Fig. 1, item 11). Col. 3, lines 19-20; Figure 1.

90. Two finite electrical conductors (Fig. 1, items 16, 17) are deposited on the front surface of the piezoelectric (Fig. 1, item 11). Col. 3, lines 30-32.

91. The conductors (Fig. 1, items 16, 17) terminate at output terminal pads (Fig. 1, items 21, 22). Col. 3, lines 44-45.

92. Figure 2 illustrates an exemplary transimpedance amplifier network connected from the output pads (Fig. 1, items 21, 22). Col. 3, lines 46-48.

93. Terminal 21 is connected to current mode operational amplifier 24, while terminal 22 is connected to current mode operational amplifier 25. Col. 3, lines 48-50.

94. The amplifiers are connected to, respectfully, inputs 26 and 27 of comparator or subtraction circuit 28. Col. 3, lines 50-52.

95. The resultant difference signal is supplied at output terminal 29. Col. 3, lines 53-55.

96. In the instance where the projectile impacts midway between the two electrodes, the output of comparator 28 at terminal 29 will be minimal. Col. 4, lines 16-19.

97. If the projectile impacts near one or the other of the electrodes, the output at terminal 29 will be substantial, its amplitude indicating the location of the projectile between the two electrodes, and the sign indicating the one of the electrodes nearest the projectile impact location. Col. 4, lines 19-24.

98. The output of the impact transducer at amplifier 29 may also be employed as a means for detecting jet stream velocity. Col. 6, lines 23-27.

99. By measuring the time of transit of the drop or drops, the velocity may be calculated based upon a known distance from the charge electrodes to the impact transducer. Col. 6, lines 27-30.

100. An ink jet system employing the subject impact transducer would preferably have the transducer at the same distance from the ink jet head as the recording medium (paper), but off to one side of the paper path. Col. 6, lines 1-5.

101. Such an arrangement forms a "home" station which would be used periodically to check jet directionality. Col. 6, lines 5-6.

Rejection of claims 4, 5, 7, 9-11, 13, 14, 17, 28, 29, 31, 32, 43 and 44

102. Claims 4, 5, 7, 9 through 11, 13, 14, 17, 28, 29, 31, 32, 43 and 44 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz and Brennan. Paper 9, pp. 3-11.

Claims 4, 28 and 43

103. Applicants group claims 4, 28 and 43 together. Paper 14, Brief, p. 5.

104. Claims 4 and 28 are representative of the claims of this group.

105. Claim 4 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, p. 4):

> 4. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:
>
> (a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];
>
> (b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21]

wherein the sensing element optionally comprises the substrate [10]; additionally comprising:

when after the dispensing of some droplets onto the substrate an error [p. 19, line 10 to p. 20, line 24] is detected [p. 19, line 10 to p. 20, line 24] in which an evaluated performance characteristic [p. 17, line 1 to p. 18, line 7] is outside a predetermined tolerance [p. 19, lines 10-15], then the source [p. 19, lines 16-17] of the error is corrected [p. 19, lines 16-17] prior to dispensing [p. 13, lines 1-28] of other of the droplets [p. 13, lines 1-28] onto that same substrate [10] or the deposition apparatus is operated [p. 19, lines 24-33] so as to compensate for the error [p. 19, line 10 to p. 20, line 24] during dispensing of other of the droplets [p. 13, lines 1-28] onto that same substrate [10].

106. Claim 28 reads as follows, with references to the drawings provided by applicants (Paper 19, pp. 9-10):

28 An apparatus [Fig. 4] for fabricating at least one addressable array [12] of biopolymers on a substrate [10], comprising:

(a) a drop dispensing unit [210] which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses [16] on the substrate [10] so as to fabricate the array [12];

(b) a sensing element [214] and amplifier [172] to detect electrical signals resulting from dispensed droplets striking the sensing element [214];

(c) a processor [140] which:

causes the drop dispensing unit [210] to dispense droplets toward the sensing element [214] after the dispensing of some droplets onto the substrate [10] and evaluates a performance characteristic of the dispensing unit based on the resulting detected signals; and

when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance then the processor, prior to causing the drop dispenser [21] to dispense droplets onto that same substrate [10], activates an operator alert or operates the apparatus so as to correct for the error before, or compensate for the error during, dispensing of other of the droplets onto that same substrate.

107. Applicants argue that nothing in Schantz requires or suggests detecting an error after dispensing some droplets onto a substrate, then dispensing additional droplets onto the same substrate after the error has been corrected or compensating for the error during the dispensing of additional droplets onto the same substrate. Paper 14, Brief, p. 8.

108. Referring to column 6, lines 23-49 of Schantz, the examiner responds that Schantz teaches an apparatus comprising a drop dispensing unit, a sensing element, an amplifier and a processor wherein the processor causes the drop dispensing unit to dispense droplets, evaluates

the dispensing and if an error is detected, activates an operator alert and/or compensates for the error during dispensing. Paper 15, Answer, pp. 3 and 5.

109. The examiner does not address whether Schantz describes or suggests that such operation occurs during dispensing on the same substrate.

110. The examiner relies on Brennan to establish that it was well known in the art at the time applicants' invention was made to use droplet dispensing devices to make arrays of biopolymers. Paper 15, Answer, pp. 3, 4 and 5.

Claims 5 and 29

111. Applicants group claims 5 and 29 together. Paper 14, Brief, p. 5

112. Claim 5 is dependent on claim 4.

113. Claim 29 is dependent on claim 28.

Claim 9

114. Claim 9 stands alone. Paper 14, Brief, p. 5

115. Claim 9 is dependent on claim 4.

Claim 7

116. Claim 7 stands alone. Paper 14, Brief, p. 5.

117. Claim 7 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, p. 5):

> 7. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop

deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:

(a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];

(b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21];

wherein the sensing element optionally comprises the substrate [10];

additionally comprising changing biopolymers or biopolymer precursors in the dispenser unit to different biopolymers or biopolymer precursors, wherein the detection and evaluation are performed after the changing and before a dispensing of any droplets for an array [p. 18, lines 12-18].

118. Applicants argue that the examiner has not pointed to anything in the cited references which motivates one to specifically perform the detection and evaluation after the fluids in the dispenser unit have been changed, and before the droplets are dispensed. Paper 14, Brief, p. 12.

119. Referring to column 6, lines 38-39, 44-49 and 60-64, the examiner responds that the method of Schantz evaluates dispensing to thereby adjust subsequent dispensing by sending a

go/no-go signal, compensating for an error and/or adjusting the number of drops dispensed. Paper 15, Answer, p. 7.

120. The examiner maintains that this express teaching of Schantz directly suggests that the print head is consistently evaluating the effectiveness of the dispensing unit, including between dispensing steps and therefore, before subsequent dispensing steps. Paper 15, Answer, p. 7.

Claims 10, 31 and 44

121. Applicants group claims 10, 31 and 44 together. Paper 14, Brief, p. 5.

122. Claims 10 and 31 are representative of the claims of this group.

123. Claim 10 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, p. 6):

> 10. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:
>
> (a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];
>
> (b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21];

wherein the sensing element optionally comprises the substrate [10];

additionally comprising when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, identifying one or more features on the array which are defective as a result of the error [p. 20, lines 8-15].

124. Claim 31 reads as follows, with references to the drawings provided by applicants (Paper 19, pp. 10-11):

31. An apparatus [Fig. 4] for fabricating at least one addressable array [12] of biopolymers with multiple features [16] on a substrate [10], comprising:

(a) a drop dispensing unit [210] which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses [16] on the substrate [10] so as to fabricate the array [12];

(b) a sensing element [214] and amplifier [172] to detect electrical signals resulting from dispensed droplets striking the sensing element [214];

(c) a processor [140] which:

causes the drop dispensing unit [210] to dispense droplets toward the sensing element [214] after the dispensing of some droplets onto the substrate [10] and evaluates a performance characteristic of the apparatus based on the resulting detected signals; and

when an error is detected in which an evaluated performance characteristic is outside a predetermined tolerance, identifies one or more features [16] on the array which are defective as a result of the error.

125. Applicants argue that the teachings of Schantz do not meet the claimed invention, which requires identifying those features on the array which are defective as a result of an error in a performance characteristic. Paper 14, Brief, p. 13.

126. The examiner responds that the apparatus of Schantz comprises a processor that is programmed to perform the functions of dispensing droplets, evaluating a performance characteristic and determining droplet error (col. 3, line 65-col. 4, line 12 and col. 4, line 60-col. 5, line 6), and further communicates the information to a remote location (i.e., printer processor, col. 5, lines 5-10, 45-51). Paper 15, Answer, p. 8.

127. The examiner maintains that the function of Schantz's processor is very similar to that instantly claimed and differs only in that Schantz's processor is not programmed to identify features on a biopolymer array which are defective as a result of an error in a performance characteristic. Paper 15, Answer, p. 8.

128. The examiner further maintains that the function of a processor is to carry out a computer algorithm, and computer algorithms are well known in the art and are routinely designed to perform desired functions. Paper 15, Answer, p. 8.

129. The examiner concludes that it would have been obvious to one of ordinary skill to combine the teachings of Schantz and Brennan and to modify the algorithm of Schantz to

identify feature errors on the biopolymer array of Brennan for the obvious benefits of accurate and precise deposit of Brennan's biopolymer onto an array. Paper 15, Answer, p. 8.

Claims 11 and 32

130. Applicants group claims 11 and 32 together. Paper 14, Brief, p. 6.

131. Claim 11 is dependent on claim 10.

132. Claim 32 is dependent on claim 31.

Claims 13 and 14

133. Applicants group claims 13 and 14 together. Paper 14, Brief, p. 6.

134. Claim 13 is representative of the claims of this group.

135. Claim 13 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, pp. 6-7):

> 13. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:
>
> (a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];
>
> (b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21]

wherein the sensing element optionally comprises the substrate [10];

and wherein:

the dispenser unit [210] comprises one or more pulse jets [p. 12, lines 20-33] which eject a droplet in response to a signal [p. 12, lines 30-31] which require priming [p. 17, line 7]; and

the evaluated performance characteristic is whether one or more of the pulse jets are primed prior to dispensing any droplets for an array [p. 17, lines 9-12].

136. Applicants do not define the term "priming" in the specification.

137. The examiner argues that Schantz teaches a method wherein the dispenser unit comprises pulse jets which eject a droplet in response to a priming signal (col. 3, lines 13-21), and the evaluated performance characteristic is whether one or more pulse jets are primed prior to deposit (col. 6, lines 23-37). Paper 9, pp. 5-6.

138. In the Appeal Brief, applicants provide a definition of "priming" from a Merriam-Webster on-line dictionary (www.merriam.com). Paper 14, Brief, p. 11.

139. The Merriam-Webster on-line dictionary defines "priming" as "FILL, LOAD" or "STIMULATE." Paper 14, Brief, p. 11.

140. Relying on page 17, lines 7-12 and page 19, lines 14-17 and 21-24 of the specification, applicants argue that "FILL, LOAD" is the definition reasonably applied to "priming" in view of the specification. Paper 14, Brief, p. 12.

141. Applicants argue that the examiner has not pointed to anything in the cited references which discloses or suggests pulse jets which require "priming" or indicate that "priming" is an evaluated performance characteristic. Paper 14, Brief, p. 15.

142. Referring to column 6, lines 23-37, the examiner responds that Schantz detects the number of drops deposited and determines whether the jets were primed (fired/stimulated) prior to deposit. Paper 15, Answer, p. 9.

143. In response, applicants continue to urge that "priming" of a pulse jet refers to filling or loading, not stimulating as argued by the examiner. Paper 18, Reply Brief, p. 5.

144. Applicants conclude that the examiner has not pointed to any disclosure or suggestion in the references for evaluating whether the pulse jets were "filled" or "loaded" prior to dispensing any droplets for an array. Paper 18, Reply Brief, p. 5.

Claim 17

145. Claim 17 stands alone. Paper 14, Brief, p. 6.

146. Claim 17 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, p. 8):

> 17. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop

deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:

(a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];

(b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21];

wherein the sensing element optionally comprises the substrate [10];

and wherein the sensor [214] comprises the substrate.

147. Applicants argue that the examiner has failed to point to any suggestion or motivation in the references to provide a sensor which comprises the substrate. Paper 14, Brief, p. 16.

148. The examiner responds that the sensing element comprising a substrate is "optionally" claimed and therefore, is not a required limitation of the claim. Paper 15, Answer, p. 10.

Rejection of claims 6, 15, 16 and 30

149. Claims 6, 15, 16 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Brown. Paper 9, pp. 11-13.

Claims 6 and 30

150. Applicants group claims 6 and 30 together. Paper 14, Brief, p. 6.

151. Claim 6 is dependent on claim 4.

152. Claim 30 is dependent on claim 28.

Claim 15

153. Claim 15 stands alone. Paper 14, Brief, p. 6.

154. Claim 15 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, pp. 7-8):

> 15. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:
>
> (a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];
>
> (b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];
>
> (c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21]
>
> wherein the sensing element optionally comprises the substrate [10];
>
> and wherein:

the dispenser unit [210] is repeatedly scanned across the substrate [10] while dispensing droplets [p. 13, lines 1-28] so as to fabricate the array [12];

the sensing element [214] is struck by droplets so as to generate electrical signals [p. 13, lines 1-28] when the dispenser unit [210] passes beyond the array [12] being fabricated on multiple scans during fabrication of the array [12].

155. Applicants argue that the examiner does not point to anything in the references disclosing or suggesting that the sensing element is struck by droplets so as to generate electrical signals when the dispenser unit passes beyond the array being fabricated on multiple scans during fabrication of the array. Paper 14, Brief, p. 18.

156. The examiner responds that Schantz teaches a method similar to that claimed and differs only in that it does not teach that the dispenser unit is repeatedly scanned across the substrate while dispensing droplets. Paper 15, Answer, p. 12.

157. Referring to column 7, lines 17-34, the examiner maintains that Brown teaches a similar method wherein the dispenser unit is repeatedly scanned across the substrate. Paper 15, Answer, p. 12.

158. The examiner does not address whether the combination of Schantz, Brennan and Brown teaches or suggests that droplets strike the sensing element when the dispenser unit passes beyond the array being fabricated on multiple scans during fabrication of the array.

Claim 16

159. Claim 16 stands alone. Paper 14, Brief, p. 6.

160. Claim 16 is dependent on claim 15.[3]

Rejection of claims 21 and 38

161. Claims 21 and 38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Fleischer. Paper 9, pp. 14-17.

Claim 21

162. Claim 21 stands alone. Paper 14, Brief, p. 6.

163. Claim 21 reads as follows, with references to the specification and drawings provided by applicants (Paper 19, pp. 8-9):

> 21. A method of fabricating at least one addressable array [12] of biopolymers [p. 8, lines 21-32] with multiple features [16] on a substrate [10] using a drop deposition apparatus [Fig. 4] having a drop dispenser unit [210] and a sensing element [214 (170)], comprising:
>
> (a) for each of multiple addresses [16], dispensing droplets [p. 13, lines 1-28] carrying the biopolymers [p. 8, lines 21-32] or biopolymer precursors [p. 8, line 32 to p. 9, line 14] from a drop dispenser unit [210] onto the sensing element [214 (170)], and onto the substrate [10] so as to fabricate the array [12];
>
> (b) detecting electrical signals [p. 15, lines 16-21] resulting from dispensed droplets striking the sensing element [214 (170)];

---

[3]Claim 16 does not appear to specify a further limitation of the subject matter claimed. 35 U.S.C. § 112, fourth paragraph. See the last paragraph of claim 15. Claim 16 can be canceled or amended during further prosecution on remand as determined by the examiner.

(c) evaluating a performance characteristic [p. 17, line 1 to p. 18, line 7] of the deposition apparatus based on the detected signals [p. 15, lines 16-21]

wherein the sensing element optionally comprises the substrate [10];

and wherein the evaluated performance characteristic is the velocity of droplets [p. 17, lines 14-16] dispensed from the drop dispenser unit [210];

the method additionally comprising dispensing multiple droplets from the dispenser unit [210] at each of at least two different distances from the sensor [214], and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance [p. 17, lines 19-27].

164. Applicants argue that the examiner does not point to any disclosure or suggestion in the references where "droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance" as required by claim 21. Paper 14, Brief, p. 19.

165. The examiner recognizes that Schantz differs from the claimed invention in that it does not teach evaluating velocity from at least two different distances. Paper 15, Answer, p. 13.

166. The examiner maintains that Fleischer provides the motivation for evaluating performance characteristics (e.g., positioning and relative positioning) of droplet dispensing, i.e., proper dispensing alignment is critical for quality substrate fabrication. Paper 15, Answer, p. 13.

167. The examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to further analyze the performance of the dispenser

by dispensing droplets at two or more distances from the sensor to thereby analyze numerous performance characteristics for the obvious benefit of fabricating a substrate of the highest quality. Paper 15, Answer, p. 13.

168. The examiner does not address whether the combination of Schantz, Brennan and Fleischer teaches or suggests evaluating droplet velocity based on the phase difference between the detected signal from the droplets at each of the two or more distances.

Claim 38

169. Claim 38 stands alone. Paper 14, Brief, p. 6.

170. Claim 38 reads as follows, with references to the drawings provided by applicants (Paper 19, p. 11):

> 38. An apparatus [Fig. 4] for fabricating at least one addressable array [12] of biopolymers on a substrate [10], comprising:
>
> (a) a drop dispensing unit [210] which can deposit droplets carrying the biopolymers or biopolymer precursors onto different addresses [16] on the mounted substrate [20, 10] so as to fabricate the array [12];
>
> (b) a sensing element [214] and amplifier [172] to detect electrical signals resulting from dispensed droplets striking the sensing element [214];
>
> (c) a processor [140] which causes the drop dispensing unit to dispense droplets toward the sensing element [214] and which evaluates a performance characteristic of the apparatus based on the resulting detected signals, wherein the evaluated performance characteristic is the velocity or placement of droplets;

wherein the processor causes the dispenser unit [210] to dispense multiple droplets at each of at least two different distances from the sensor [214], and wherein droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance.

171. Applicants argue that the examiner has failed to establish a prima facie case of obviousness by pointing to any disclosure or suggestion in the references that "droplet velocity is evaluated based on the phase difference between the detected signal from multiple droplets at each distance." Paper 14, Brief, p. 20.

172. The examiner recognizes that Schantz differs from the claimed apparatus in that it does not teach evaluating velocity from at least two different distances. Paper 15, Answer, p. 14.

173. The examiner maintains that Fleischer provides the motivation for evaluating performance characteristics (e.g., positioning and relative positioning) of droplet dispensing, i.e., proper dispensing alignment is critical for quality substrate fabrication. Paper 15, Answer, p. 14.

174. The examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to further analyze the performance of the dispenser by dispensing droplets at two or more distances from the sensor to thereby analyze numerous performance characteristics for the obvious benefit of fabricating a substrate of the highest quality. Paper 15, Answer, p. 14.

175. The examiner does not address whether the combination of Schantz, Brennan and Fleischer teaches or suggests that droplet velocity is evaluated based on the phase difference between the detected signal from the droplets at each of the two or more distances.

C. Discussion

The claims will not be discussed in numerical order. Rather, they will be discussed in the same order they were addressed by applicants in the Appeal Brief. Paper 14, Brief, pp. 5-6.

1. Rejection of claims 4, 28 and 43

The examiner bears the initial burden of presenting a prima facie case of unpatentability. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

The examiner has not convincingly addressed how the combined teachings of Schantz and Brennan suggest a method of fabricating an array wherein an error is detected after some droplets are dispensed on a substrate and the source of the error is corrected prior to dispensing additional droplets on the same substrate or the deposition apparatus is operated to compensate for the error during the dispensing of other droplets onto that same substrate, as required by claim 4. Similarly, the examiner has not convincingly addressed how the combined teachings of Schantz and Brennan suggest a dispensing apparatus comprising a processor which, in response to an error detected after some droplets are dispensed on a substrate, activates an operator alert or operates the apparatus to correct the error or compensate for the error, prior to dispensing additional droplets onto the same substrate, as required by claim 28.

For this reason, the rejection of claims 4, 28 and 43 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan is reversed.

2. Rejection of claims 5 and 29

Claim 5 is dependent on claim 4, and claim 29 is dependent on claim 28. See 37 CFR § 1.75(c) (2003) (claims in dependent form shall be construed to include all the limitations of the

claim incorporated by reference into the dependent claim). The rejection of claims 4 and 28 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan has been reversed. See section C.1., supra. Therefore, the rejection of claims 5 and 29 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan is also reversed.

3. Rejection of claim 9

Claim 9 is dependent on claim 4. See 37 CFR § 1.75(c) (2003). The rejection of claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan has been reversed. See section C.1., supra. Therefore, the rejection of claim 9 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan is also reversed.

4. Rejection of claim 7

In order to support a prima facie case of obviousness within the meaning of 35 U.S.C. § 103, there must be some reason, suggestion or motivation found in the prior art whereby a person of ordinary skill in the art would have made the modification required. Manifestly, that knowledge cannot come from the applicants' invention itself. Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 678-79, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988); In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). On this record, the examiner has failed to convincingly point to any evidence or facts found in the prior art which would have led one of ordinary skill in the art to modify the method described in Schantz to perform the detection and

evaluation steps after changing the fluid to be dispensed and before dispensing the fluid to form an array, as required by claim 7.

Relying on column 6, lines 38-39, 44-49 and 60-64, the examiner argues that Schantz suggests that the print head is consistently evaluating the effectiveness of the dispensing unit, including between dispensing steps and therefore, before subsequent dispensing steps. Paper 15, Answer, p. 7.

Schantz describes that an evaluation is conducted after fluid has been dispensed on a page. See Schantz, col. 6, lines 39-42 (the printer processor tests a few nozzles on the fly at the end of a print cycle on a page). However, what is missing from Schantz is any convincing teaching that the effectiveness of the dispensing unit is evaluated after the fluid to be dispensed is changed but before it is dispensed on a page, as required by claim 7. For this reason, the rejection of claim 7 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz and Brennan is reversed.

5. Rejection of claims 10, 31 and 44

As explained above, to support a prima facie case of obviousness within the meaning of 35 U.S.C. § 103, there must be some reason, suggestion or motivation found in the prior art whereby a person of ordinary skill in the art would have made the modification required. That knowledge cannot come from the applicants' invention itself. Diversitech, 850 F.2d at 678-79, 7 USPQ2d at 1318; Geiger, 815 F.2d at 688, 2 USPQ2d at 1278; Interconnect Planning, 774 F.2d at 1143, 227 USPQ at 551.

On this record, the examiner has not convincingly addressed how any evidence or facts found in the prior art would have led one of ordinary skill in the art to modify the processor described in Schantz to identify one or more features on an array which are defective as a result of an error in a performance characteristic, as required by claim 31. Likewise, the examiner has not referenced any credible evidence in the prior art which would have led one of ordinary skill in the art to modify the method described in Schantz to identify one or more features on an array which are defective as a result of an error in a performance characteristic, as required by claim 10. Therefore, the rejection of claims 10, 31 and 44 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz and Brennan is reversed.

6. Rejection of claims 11 and 32

Claim 11 is dependent on claim 10, and claim 32 is dependent on claim 31. See 37 CFR § 1.75(c) (2003). The rejection of claims 10 and 31 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan has been reversed. See section C.5., supra. Therefore, the rejection of claims 11 and 32 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan is also reversed.

7. Rejection of claims 13 and 14

Applicants do not define the term "priming" in the specification. However, in the Appeal Brief, applicants provide a definition of "priming" from a Merriam-Webster on-line dictionary. The dictionary defines "priming" as "FILL, LOAD" or "STIMULATE." Paper 14, Brief, p. 11.

The examiner interprets "priming" to mean "STIMULATE." Paper 9, pp. 5-6; Paper 15, Answer, p. 9. However, relying on page 17, lines 7-12 and page 19, lines 14-17 and 21-24 of the

specification, applicants argue that "FILL, LOAD" is the definition reasonably applied to "priming" in view of the specification. Paper 14, Brief, p. 12. Those portions of the specification read as follows:

> Processor 140 will control the apparatus and interpret the signals from the sensing element in accordance with the performance characteristic to be evaluated. For example, since pulse jets typically require priming the evaluated performance characteristic may be whether one or more of the pulse jets of head 210 are primed. In this case, when head 210 is positioned over sensing element 214 and a particular pulse jet is fired by processor 140, if a corresponding signal is obtained from sensing element 214 then priming is indicated. If no corresponding signal is obtained from sensing element 214, then a de-primed condition is indicated. [Specification, p. 17, lines 5-12.]
>
> * * *
>
> [F]or evaluating priming, if processor 140 operates head 210 to dispense a series of droplets and less than the total number is detected, no tolerance may be allowed such that this condition is registered as a de-primed condition (at least on a first check). [Specification, p. 19, lines 14-17.]
>
> * * *
>
> [I]n the case of de-priming, processor 140 may fire the de-primed pulse jet one or more times until it is primed (as determined when a signal from sensor element 214 corresponding to the firing signal, is received by processor 140). [Specification, p. 19, lines 21-24].

During examination, claims are to be given the broadest reasonable interpretation consistent with the specification. In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969). Applicants' interpretation of the term "priming" may well be plausible. In any event, the examiner's interpretation of "priming" is plausible because it is consistent with the use of that term in applicants' specification. See, e.g., Specification, p. 17, lines 7-12.

To the extent that the term "priming" can be interpreted to mean "STIMULATE," claim 13 includes unpatentable subject matter. See Schantz, col. 3, lines 13-15 and col. 6, lines 23-27. In re Muchmore, 433 F.2d 824, 826, 167 USPQ 681, 683 (CCPA 1970). For this reason, the rejection of claims 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz and Brennan is affirmed.

8. Rejection of claim 17

Claim 17 is ambiguous. Claim 17 reads, in part, as follows:

> (c) evaluating a performance characteristic of the deposition apparatus based on the detected signals;
> wherein the sensing element optionally comprises the substrate;
> and wherein the sensor comprises the substrate.

The first limitation, "the sensing element optionally comprises the substrate," does not require the sensing element to comprise the substrate. However, the second limitation, "the sensor comprises the substrate," requires the sensor to comprise the substrate.[4] This situation is problematic because one of ordinary skill in the art must speculate whether the claim requires the sensing element to comprise the substrate. Indeed, the combined teachings of Schantz and Brennan satisfy the first limitation but do not appear to satisfy the second limitation.

Before this panel can decide whether to affirm or reverse the rejection of claim 17, the examiner and applicants need to resolve this issue. Therefore, the rejection of claim 17 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz and Brennan is vacated and remanded.

---

[4]According to applicants, "sensor" and "sensing element" are used interchangeably. Paper 18, Reply Brief, p. 6.

9. Rejection of claims 6 and 30

Claim 6 is dependent on claim 4, and claim 30 is dependent on claim 28. See 37 CFR § 1.75(c) (2003). The rejection of claims 4 and 28 under 35 U.S.C. § 103(a) as being unpatentable over the combined teachings of Schantz and Brennan has been reversed. See section C.1., supra. Therefore, the rejection of claims 6 and 30 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Brown is also reversed.

10. Rejection of claim 15

The examiner has not convincingly addressed whether the combined teachings of Schantz, Brennan and Brown teach or suggest that a sensing element is struck by droplets so as to generate electrical signals when a dispenser unit passes beyond an array being fabricated on multiple scans during fabrication of the array. For this reason, the rejection of claim 15 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Brown is reversed. See Oetiker, 977 F.2d at 1445, 24 USPQ2d at 1444 (the examiner bears the initial burden of presenting a prima facie case of unpatentability).

11. Rejection of claim 16

Claim 16 is dependent on claim 15. See 37 CFR § 1.75(c) (2003). The rejection of claim 15 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Brown has been reversed. See section C.10., supra. Therefore, the rejection of claim 16 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Brown is also reversed.

12. Rejection of claim 21

The examiner has not convincingly addressed whether the combined teachings of Schantz, Brennan and Fleischer teach or suggest a method wherein droplet velocity is evaluated based on the phase difference between a detected signal from multiple droplets dispensed at two or more different distances from a sensor. For this reason, the rejection of claim 21 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Fleischer is reversed. See Oetiker, 977 F.2d at 1445, 24 USPQ2d at 1444 (the examiner bears the initial burden of presenting a prima facie case of unpatentability).

13. Rejection of claim 38

The examiner has not convincingly addressed whether the combined teachings of Schantz, Brennan and Fleischer teach or suggest an apparatus wherein droplet velocity is evaluated based on the phase difference between a detected signal from multiple droplets dispensed at two or more different distances from a sensor. For this reason, the rejection of claim 38 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Schantz, Brennan and Fleischer is reversed. See Oetiker, 977 F.2d at 1445, 24 USPQ2d at 1444 (the examiner bears the initial burden of presenting a prima facie case of unpatentability).

D. Order

Upon consideration of the record, and for the reasons given, it is

ORDERED that the rejection of claims 13 and 14 under 35 U.S.C. § 103(a) is affirmed;

FURTHER ORDERED that the rejection of claims 4 through 7, 9 through 11, 15, 16, 21, 28 through 32, 38, 43 and 44 under 35 U.S.C. § 103(a) is reversed;

FURTHER ORDERED that the rejection of claim 17 under 35 U.S.C. § 103(a) is vacated and remanded for action not inconsistent with the review expressed herein;

FURTHER ORDERED that in addition to affirming the examiner's rejection of one or more claims, this decision contains a remand. 37 CFR § 41.50(e) (effective September 13, 2004, 69 Fed. Reg. 49,960 (Aug. 12, 2004), 1286 Off. Gaz. Pat. & Trademark Office 21 (Sept. 7, 2004)) provides:

> Whenever a decision of the Board includes a remand, that decision shall not be considered final for judicial review. When appropriate, upon conclusion of proceedings on remand before the examiner, the Board may enter an order otherwise making its decision final for judicial review.

Regarding any affirmed rejection, 37 CFR § 41.52(a)(1) (2004) provides, "Appellant may file a single request for rehearing within two months of the date of the original decision of the Board."

The effective date of the affirmance is deferred until conclusion of the proceedings before the examiner unless, as a mere incident to the limited proceedings, the affirmed rejection is overcome. If the proceedings before the examiner do not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of Patent Appeals and Interferences for final action on the affirmed rejection(s), including any timely request for rehearing thereof; and it is

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a) (2004).

AFFIRMED-IN-PART, REVERSED-IN-PART, and VACATED and REMANDED-IN-PART

WILLIAM F. SMITH
Administrative Patent Judge

FRED E. McKELVEY, Senior
Administrative Patent Judge

ADRIENE LEPIANE HANLON
Administrative Patent Judge

) BOARD OF PATENT APPEALS AND INTERFERENCES

cc (via First Class Mail):

022878
AGILENT TECHNOLOGIES, INC.
Intellectual Property Administration, Legal Department
P.O. Box 7599
M/S DL429
Loveland, CO 80537-0599

(via Federal Express):

AGILENT TECHNOLOGIES, INC.
cc: CT CORPORATION SYSTEM
4701 Cox Road
Glen Allen, VA 23060